

MORPHINE INJECTIONS FOLLOWED BY EMPHYSEMATOUS GANGRENE (MALIGNANT CŒDEMA).

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PRELIMINARY REMARKS.

ONE of the varieties of septicæmia well known to, and dreaded by, the surgeons of former generations, but now almost banished from the surgical wards, is emphysematous gangrene, or, in modern parlance, malignant cœdema (Koch).

The general adaptation of the great principle of cleanliness, in even insignificant lesions and operative interference, has almost done away with this formidable foe to the wounded, and where it does appear it follows not, as a rule, in the wake of the surgeon's instruments. In our days, if at all, it is met with in open fractures and deep lacerated wounds which in some manner have come in contact with filthy material harboring a certain pathogenous germ.

It is at present a well-settled fact that this form of wound-infection owes its origin to a well-characterized bacterium, the bacillus of malignant cœdema.

This is not the place to exhaustively discuss the form, life-properties, habitat, and manner of growth of the bacterium in question. Suffice it to say that it was first experimented with by Pasteur, who obtained it by injecting putrid blood into animals. They died, and Pasteur called the bacillus invariably found in the tissues affected *vibrio septique*. Koch afterward re-discovered it by introducing garden-earth into pockets made under the skin of mice, rabbits, etc. He called the micro-organism found after the death of the animals, the bacillus of malignant cœdema. It is most abundantly met with in the neighboring tissue of the skin-pocket and on the serous membranes of the abdominal and thoracic cavities.

The pathological changes produced by the microbe by means of hypodermic injections of fluid containing the germ,

in animals, are diffuse œdema of the neighborhood of the inoculation, accompanied by emphysema. The latter is due to gas-formation in the tissues. The disease (in animals) clinically resembles anthrax, from which, however, it can be easily differentiated by the manner of death, by the form of the bacillus found, by its manner of spreading through the organism (the anthrax bacillus proliferating in the blood, the other in the tissues), and, last, by its behavior in the cultivating media.

Leaving all the other distinguishing characteristics aside, I will only state that our bacillus, when examined under the microscope, is a slender rod, growing at times into false threads, resembling very much the anthrax bacillus, from which it differs by the rounded ends, the latter having both of its extremities slightly excavated.

It is met with almost everywhere, to wit: in the superficial strata of manured ground, in putrefying cadavers, in old rags, in dish-water, etc. It forms spores, and it is generally in this state that the bacillus occurs in the substances named and is introduced into the living body.

The artificial production of malignant œdema in man has been observed before. Thus Brieger and Ehrlich¹ have described it in two cases of typhoid fever following the subcutaneous injection of tincture of musk, which probably contained the organisms. The patients died. I myself² reported a fatal case of malignant œdema in a woman who had been in the habit of producing abortions on herself and had probably employed an unclean instrument in the last operation for that purpose.

Two recently observed cases following the use of the hypodermic needle in morphinists are perhaps of interest to those who have frequent dealings with such patients.

That the morphine-injector is very careless as to the condition of his syringe, and that he will continue its use, although every injection is sure to be followed by an abscess, is a fact too well known to be dwelled upon. That in such

¹ Berlin. klin. Wochschr., 1882, No. 44.

² Bremer on Malignant œdema and Fat Embolism. American Journal of Med. Sc., June, 1888.

cases the syringe is "infected" with pus-producing organisms, is well known. To what extent the weakened general condition, the lowered tone of the system, and the inadequate or vitiated metabolism³ of the body, favor the propagation of these pus-producers when once introduced into the tissues is as yet undecided. We know that even without special preparation of the "soil," the pyogenic staphylococci, when introduced into animal tissues, will set up typical suppuration. They differ in this respect from the bacillus of malignant œdema, of which the human body, as a rule, is not susceptible. But that under certain conditions this bacillus may invade the human organism, the following two cases well illustrate:

CASES.

Case I.—Mrs. M., aged thirty, has been the victim of the morphine habit for a number of years; she has also been addicted to the use of stimulants to a considerable extent. She is stout in appearance, but her flesh is soft and flabby. The abdominal walls are especially thick with a large amount of adipose tissue. She has been in the habit of using the hypodermic syringe (fifteen grains of morphine a day), and her arms and abdomen are tattooed with the marks of the needle. One of these punctures had inflamed, and when seen by Dr. Prewitt, of this city, she had high fever, frequent pulse, some irregularities of the heart's action, anorexia, and diarrhoea. Over the abdomen, a little above the level of the umbilicus and between that and the left lumbar region, there was a broad inflamed indurated patch, four or five inches in breadth and five or six in length, which fluctuated in the centre and was resonant on percussion over this part. A thought of an inflamed hernia, with a flatulent knuckle of bowel included, suggested itself; but the history of the case excluded this. Ether was administered at the solicitation of the patient. Upon making an incision, the bistoury entered as though penetrating a bag of air, giving exit to a puff of exceedingly fetid gas, followed by a quantity of equally fetid pus.

For a moment the possibility of having cut into a knuckle of bowel caused some trepidation, but a slight investigation showed that the gas came only from the abscess-cavity.

Unfortunately none of the pus was preserved for examination. Judging the case in the light of recent experiences,

³ Compare the furunculosis in diabetes.

our present knowledge of gas-containing abscesses, there is no doubt that the bacillus of malignant œdema would have been found. (Compare the next case.)

The probable carrier of the infectious material was the syringe, or perhaps the water in which she dissolved the morphine. As she injected it secretly, she probably was not very particular in choosing the purest article, and had, at times, to take any kind of water at hand.

The incision was made free, and under thorough anti-septic treatment the abscess assumed a healthy character and rapidly filled up. A second abscess formed in the lower border of the indurated area of much smaller dimensions, and was opened, but presented none of the peculiar features of the first.

The further progress of the case and its treatment are not germane to the subject of this paper, and will not be dealt with here. I saw the case only after healthy granulations of the wound had set in, when none of the infectious material could be obtained for examination.

Case II.—M. C., aged twenty-eight, has been injecting morphine for the last eight years. The habit has lately grown upon him to such an extent that he has used up to thirty grains a day. In order to prevent fainting-spells, as he alleges, and to be competent to discharge his duties as a bank-officer, he was obliged to inject with the utmost quickness, and since the skin of his arms was nearly unfit for further injections, owing to the extensive scars, the results of former suppurations, he had formed the habit of injecting through his pantaloons into the muscles of the thigh and the nates. He claims that he could do this in the bank, unnoticed by the other employés. At the instance of his family he had resolved to enter upon a "weaning cure," and the day for its commencement had been set. Probably to once more enjoy the effects of the drug to the fullest extent before parting with it "forever," he injected for a few days more recklessly than ever, and presented himself on the morning of the day appointed for the beginning of the ordeal in a most wretched condition. On examination an extensive reddish-blue swelling, fully the size of two fists, involving almost the whole of the right buttock, which had been of late the favorite place of the injections, presented itself. There were also painless nodules, representing abscesses, all over the body, varying between the size of a bean and that of a walnut. There was only a slight elevation of temperature, pulse 90, sickness of the stomach, and general malaise.

A free incision having been made, an enormous amount of stinking, bubbling, pale reddish looking fluid, mixed with white streaks, burst forth. Large shreds of mortified connective-tissue and liquid fat were also discharged. The peroxide of hydrogen was poured into the cavity twice a day, and the enormous defect, large enough to hold a man's fist, healed up in a remarkably short time.

The oxygen was resorted to from theoretical considerations. The bacillus of malignant œdema is an anaërobe; exposure to the atmospheric air, or, still better, oxygen in some form or other will interfere with its proliferation. Probably, however, the simple free opening of the abscess would have sufficed.

The culture-experiment (gelatine and agar) revealed the presence of the *staphylococcus aureus* and *albus*; the piston of the syringe was planted in nutrient gelatine, and on the third day the unmistakable gas-formation took place around the leather disks. No further inoculation-experiments were undertaken.

There was then a "mixed infection" in the sense of Brieger and Ehrlich.⁴ The bacillus of malignant œdema is one of those microbes which, in man, are comparatively harmless. It takes another microbial invasion to aid the virus under consideration to gain a foothold in the tissues of the body. Experiments carried on lately in this direction have proved that quite a number of micro-organisms, which are absolutely innocuous when introduced singly, become pathogenic when they enter into a higher organized body in combination with another equally harmless microbe.

In the two cases reported, and in others similar in kind, it seems that the pus-producers pave the way for the successful colonization of the bacillus of malignant œdema.

Another factor which probably contributes to the greater facility of the microbe establishing itself in the body is to be found in the manner of inoculation. Experiments with a number of germs have proved the fact that inoculations are negative when made by the knife, *e. g.*, making an ordinary pouch under the skin; whereas the inoculation proves successful when done by the hypodermic syringe (*Sputmann-septicæmia in rabbits*). It is perhaps unnecessary to call to mind the many mishaps which were caused by the syringe during the late Elixir of Life craze.

⁴ The abnormal metabolism as a predisposing agent has been alluded to above. Cf. loc. cit.